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Chemical Weed Control in Minnesota - 1952

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THE recommendations and discussions in this pamphlet are based on the "Recommendations of the Research Committee of the North Central Weed Control Conference for 1952." This committee represents state universities throughout the area. Since the effectiveness of herbicides depends on factors that vary from region to region, the recommendations have been modified where necessary to make them fit Minnesota conditions.

Perennial Weeds

PERENNIAL BROAD-LEAVED WEEDS

Many perennial weeds can be controlled with 2,4-D, but eradication is often hard. Treating them during the actively growing stage—generally near the bud stage—gives best results. One application seldom gives eradication. Repeat treatments are necessary. Where long-time control, under cropping conditions, is the objective, govern the rate of application by the maximum amount that the crop will tolerate.

Chlorates, borates, and similar chemicals are also valuable for the control of perennial weeds, especially to kill small patches of weeds and weeds in uncultivated land where it does not matter if the soil is sterilized for a year or more.

Canada Thistle and Perennial Sow Thistle

Two applications of 2,4-D each year for two or more years are generally necessary to kill these weeds. Make the first applications each year at the bud stage and the later treatments in the early fall when the resprouting thistles are in the rosette stage (before the flower stem develops). Apply from ½ to 2 pounds of 2,4-D per acre, using the lower rates in growing crops. Pay particular attention to control of above-

ground parts to weaken the plant and to prevent seed production.

Good control has been obtained by treating infested areas with 2,4-D and later cultivating the area intensively. Cultural practices that have proved effective are (1) spring duckfooting followed by sowing of sorgo, sudan grass, or proso millet about July 1, (2) using alfalfa or alfalfa-grass mixture and cutting for hay over several years, (3) fallowing where erosion is no problem.

For small areas use Borascu at 20 pounds, concentrated Borascu at 10 pounds, or sodium chlorate at 3 to 5 pounds per square rod.

Hoary Cress (Perennial Peppergrass)

In grain crops, apply one pound of 2,4-D (preferably amine salt) from the advanced rosette to early bud stage. This application will prevent this weed from developing normally, from competing effectively, and from producing seeds and will reduce stand some.

In dense stands of adapted grass repeat treatments of 1 pound of 2,4-D as needed each year for two or more years. Where solid infestations occur, use 2 to 3 pounds per acre the first year and lower rates for succeeding treatments.

On noncrop land seed the infested areas to an adapted grass as an aid to 2,4-D treatment. Treatments at the bud to bloom stage are usually most effective. Be sure to use enough carrier to give thorough coverage. You can expect reinfestation from seed, and

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these seedlings may be destroyed by lighter applications of 2,4-D. For small areas use 20 pounds of Borascu, 10 pounds of concentrated Borascu, or 4-7 pounds sodium chlorate per square rod.

Russian Knapweed

For large areas, cultivation is the most reliable control. Sodium chlorate and boron compounds are effective on small spots. Use 20 pounds of Borascu, 10 pounds of concentrated Borascu, or 4-7 pounds sodium chlorate per square rod.

The use of 2,4-D has given erratic results, varying from good to very poor, and is not generally recommended. Applied at ½ to ¾ pound per acre, it will usually prevent seed production and may be useful selectively in crops. Reduction of weed stand has been reported when 2,4-D was used along with seeding grass.

Leafy Spurge

In grain crops top growth of leafy spurge is easily slowed down, partially killed, and usually prevented from setting seed if treated when four to six inches high with an ester of 2,4-D at 8 ounces per acre of acid equivalent. Expect seasonal control, not eradication.

On cultivated land five applications of one pound per acre of 2,4-D, ester, in two consecutive years, combined with cultivation when necessary, frequently eradicate the weed.

On sodded soils two to three pounds of 2,4-D, ester, per acre, applied at the flowering stage, often give complete eradication. Repeat the treatment if necessary.

Seeding to a strongly competing grass such as brome, together with applications of 2,4-D at 2 pounds per acre after the grass is well established, frequently completely eradicates leafy spurge.

For small areas use 10-15 pounds of Borascu, 5-8 pounds concentrated Borascu, or 3-5 pounds sodium chlorate per square rod.

Field Bindweed

Field bindweed is most susceptible to 2,4-D when growing vigorously. Applications are effective in late fall but most satisfactory in bud to bloom stages in the spring. One-half to one pound of 2,4-D per acre is required to give practical control.

For small areas use 20-30 pounds of Borascu, 10-15 pounds of concentrated Borascu, or 3-5 pounds sodium chlorate per square rod.

PERENNIAL GRASSY WEEDS

Quackgrass

Cultivation during the summer and fall months is the most practical method of con-

trol on large areas. TCA is effective when applied at rates of 26 to 70 pounds per acre. The quackgrass rhizomes may not be eliminated completely, so follow-up cultivation or chemical applications are often needed.

Since there is very little movement of TCA, it requires 66 pounds or more per acre if it is applied to the foliage. Good kills have resulted from two applications, one of 44 pounds in one year and 22 the next, or vice versa.

The lower rate may be used if the field is cultivated before treatment. Sufficient moisture to move the chemical to the root and rhizome is necessary for effective control. The most practical time of application is August to October.

Tolerance of crops is in the following descending order: flax, potatoes, red pine, oats, corn, barley, wheat, and soybeans, with the biggest break occurring between corn and barley. Normal growth of crops sown or planted in the spring following application of 22 pounds of TCA in the fall can be expected from flax, potatoes, oats, corn, red pine, green ash, jack pine, white spruce, Russian olive, and Bolleana poplar.

Annual Weeds

POST-EMERGENCE SPRAYING

2,4-D—Many annual broad-leaved weeds can be controlled with 2,4-D, but some species are quite tolerant. Annual weeds are more susceptible in the seedling and early stages of development and when vigorous growth is taking place. Some weeds which are resistant at later stages of growth are readily killed when young and actively growing.

For susceptible weeds such as mustard in growing crops, about 1-1½ ounces of ester or 3 ounces of amine per acre are generally required. Lambsquarters and pigweed may require from 1½-2 ounces of ester or 4 ounces of amine. MCP can also be used at the same rates as 2,4-D, amine. It is less injurious to flax than 2,4-D.

DNOSBP—Dinitros may be used on legumes. They require large amounts of water for application. Rates to use vary with temperature, for high temperatures increase effectiveness. TCA at 4.4 to 7 pounds per acre can be used in flax for the elimination of weedy annual grasses other than wild oats.

PRE-EMERGENCE SPRAYING

Control of both grassy and broad-leaved weeds has been tried with 2,4-D applied at

rates from 1 to 2 pounds per acre in some areas, but these treatments have not controlled grassy weeds in Minnesota. Dry weather after application may make the treatment ineffective. TCA, when applied at 4.4 to 7 pounds per acre, will control grassy weeds (except wild oats) when there is plenty of moisture.

USING HERBICIDES IN FIELD CROPS

Small Seeded Legumes

Legumes in small grains—Ladino clover, alsike clover, red clover, and alfalfa in small grain may be treated with salts of 2,4-D or MCP at rates up to ¼ pound of the acid equivalent per acre without serious loss of stand. Don't use these treatments, particularly when alfalfa is the legume, unless the crop is seriously threatened by weed infestations. Sweet clover will not tolerate 2,4-D.

Applications made when the small grain foliage is at least 8 to 10 inches high decreases possibility of injury to legume stand.

Use dinitro sprays in seedling legumes for the control of small broad-leaved annual weeds. Ammonium salt of DNOSBP at the rate of ¾ to 1¼ pounds in 60 to 80 gallons of water is suggested.

TCA, sodium salt, at 5 to 10 pounds per acre may be used to control annual grasses (except wild oats) on seedling stands of alfalfa and sweet clover.

Legumes growing alone—Application of 2,4-D, MCP, and ammonium salt of DNOSBP may be made to established stands of legumes, except sweet clover, when top growth is dormant in early spring or immediately following a hay crop. Established stands of alfalfa and sweet clover may be treated at the same stages with 5 to 10 pounds of TCA, sodium salt, for control of seedling annual grasses except wild oats. Red clover and alsike are susceptible to TCA.

Large-Seeded Legumes

Post-emergence treatment of soybeans and peas with 2,4-D is not recommended. Peas may be treated with ¾ to 1¼ pounds of the ammonium salt of DNOSBP in 60 to 80 gallons of water for control of small annual broad-leaved weeds.

Pre-emergence applications of chemicals have given such erratic results that this practice cannot generally be recommended.

Flax

MCP is as effective as 2,4-D for controlling weeds in flax and is somewhat less harmful to flax itself. Consequently, formulations of MCP are recommended as alterna-

tives to the accepted 2,4-D formulations. Use 3 ounces of 2,4-D or MCP, amine, for susceptible weeds such as mustard, or 4 ounces for lambsquarters, pigweed, Frenchweed, cockleburs, marsh elder, and ragweed. B5128, Dakota, and Minerva are more susceptible than other recommended varieties of flax.

Three years' data have shown rather consistently that sodium and calcium TCA at rates of 4.4 to 7 pounds per acre will effectively control foxtail in flax without damaging the flax when the chemical is applied at early stages of weed growth. For best results, apply when a large number of grass seeds have germinated and most of the seedlings are less than three inches tall.

Applications of 1.3 to 1.8 pounds of DNOSBP or DNOSAP in 2 to 6 gallons of oil a few days before maturity of the flax appear to have great promise as a means of killing green weeds in flax and forcing maturity of the crop. Their use to make combining easier, particularly straight combining, appears to be justified.

Pasture and Range Grasses

Established stands of grasses are quite tolerant to 2,4-D and 2,4,5-T. In general, these materials may be used at rates necessary for weed or brush control without appreciable injury to grasses. Bent grasses may be susceptible under some conditions.

Seedlings of perennial grasses may be treated with 2,4-D if the broad-leaved weeds are a problem and if the land is not heavily infested with seeds of the weedy annual grasses. Rates up to ¾ pound of ester per acre may be used after the seedlings have reached the 2- to 4-leaf stage of growth.

Barley, Oats, and Spring Wheat

The growing season of these small grains can be divided into at least four periods. Each responds in a different way to treatment with 2,4-D. In barley the periods are (1) a susceptible seedling period extending from shortly after emergence to the five- to six-leaf stage; (2) a relatively tolerant period between the five-leaf and early boot stages; (3) a second susceptible period extending from the boot stage to the fully headed stage; and (4) a relatively resistant period beginning when the grain is in the milk.

Barley is generally most susceptible during the first period, followed in order by the third, second, and fourth periods. Oats and wheat follow the same general pattern as barley except that oats is somewhat more tolerant during the first and third periods and is often more susceptible during the second period.

Apply 2,4-D during the second and fourth periods in order to cause a minimum of injury to the crop. Any reduction in yield is generally offset by the advantages gained in weed control. Apply a maximum of ¼ to ½ pound during the second period and a maximum of ½ to ¾ pound during the fourth (post-heading) period.

The lower suggested rates are maximum rates for an ester formulation. At rates adequate for susceptible weeds like mustard, the stage of application is not so important as it is when ½ pound and over of 2,4-D, amine, are used. Mindo and, to a lesser degree, Clinton and Andrew oats have been more susceptible to 2,4-D than Bonda, Ajax, Zephyr, Shelby, James, and Gopher.

Varietal differences in barley have been small but Feebar, Plains, and Moore showed somewhat more susceptibility than Barbless, Mars, Kindred, Montcalm, and Vantage.

Winter Wheat

Winter wheat may be treated safely with 2,4-D to control most annual broad-leaved weeds without injury to the crop if applied in the spring any time from the fully tillered to the early boot stage. Apply from ¼ to ½ pound of acid to the acre as an ester or up to ¾ pound as an amine or as sodium salt. Similar applications made in the fall usually damage the crop.

Use preharvest treatment when the wheat is in the milk to hard dough stage only when weeds threaten to interfere seriously with harvesting. A dosage of 1 pound of acid to the acre is required at this stage and may damage the crop. Weed control at this stage is often not satisfactory.

Corn

Post-emergence—Some injury to corn may be expected from spraying with 2,4-D. Until the corn is tasselled, stalk brittleness commonly follows over-all spraying. A storm or cultivation shortly after treatment may result in severe loss from breakage. Hybrids vary in their susceptibility to 2,4-D, but differences are not important at rates below ½ pound per acre. Do not spray seed fields unless the tolerance of the parents is known.

Corn is most susceptible for about a week after emergence and most resistant after ear formation. Susceptibility is associated with rapid growth. Injury is not important at ¼ pound of 2,4-D, amine, per acre—an amount sufficient to kill susceptible weeds such as cocklebur and wild mustard. Rates necessary to control more resistant weeds such as Canada thistle usually reduce yields.

Pre-emergence—The use of 2,4-D has not controlled grass weeds in Minnesota. Four to 8.8 pounds of TCA, sodium salt, applied to the soil following the last cultivation, have controlled foxtail without reduction of corn yields. The chemical should be applied with drop nozzles in order to wet not more than the lower six inches of stalk. When 2,4-D is combined with TCA, broad-leaved annual weeds can also be killed.

Weeds in Gardens

By the wise use of chemicals, it is possible to reduce greatly the cost of weeding many garden crops. In addition, using them may save some crops when wet weather makes it impossible to cultivate. However, chemical weed control is not a substitute for cultivation but rather a supplement to standard cultural practices.

All rates of application are based on over-all coverage. But if you find it is more economical to treat only a narrow strip over the row, reduce the application accordingly. In general, use the herbicidal treatments suggested here only once in any one season. Our recommendations here are largely for truck garden operators and so applications are given on the acre basis.

• Asparagus—Apply 2,4-D, amine, at 2 pounds per acre as a pre-emergence treatment on established beds. Apply after disking in the spring or after post-harvest disking, when no spears are showing. For more effective control of annual grasses add TCA at the rate of 5 to 10 pounds per acre to the 2,4-D spray.

Spot treat with 40 to 50 pounds of TCA per acre just after disking to control small patches of quackgrass. Use Stoddard solvent at 80 to 100 gallons, DNOSBP or DNOSAP at 1 pound, or 2,4-D, amine, at 1 pound per acre as a contact pre-emergence treatment to control weeds in asparagus seedbeds.

• Beans—A residual pre-emergence application of 6 to 8 pounds of DNOSBP or DNOSAP or 16 to 20 pounds of sodium PCP per acre will control most annual weeds in beans. Where annual grasses are a problem in lima beans, as high as 10 pounds of DNOSBP or 24 pounds of PCP may be used.

• Beets—For the control of annual grasses, apply TCA at 8 to 10 pounds per acre at least two days before any beets will emerge.

- **Carrots, Celery, Dill, Parsnips, and Parsley**—Stoddard solvent at 80 to 100 gallons per acre gives good control of annual weeds. Apply as soon as most weeds have emerged but before any are over two inches high. Do not spray carrots or parsnips after the tap root is more than ¼ inch in diameter. On celery, use only in the seedbed.

- **Onions**—For the control of weeds that have emerged before the onions, use Stoddard solvent at 40 to 80 gallons per acre as a pre-emergence spray or calcium cyanamid dust at 75-100 pounds per acre. Post-emergence sprays of 2 to 3 per cent sulfuric acid at the rate of 100 gallons per acre, applied when the onions are in the "knee" stage or have at least one true leaf, will control many small annual weeds. Purslane is controlled only in the cotyledon stage, and lambsquarters and grasses are usually not killed. Eight to 12 pounds per acre of potassium cyanate in 50 to 100 gallons of water may be used in the same way as sulfuric acid.

- **Potatoes**—While blind cultivation is generally preferred to control weeds, in wet weather chemical treatments may be valuable. Applications of 2,4-D at 1½ to 2 pounds, DNOSBP or DNOSAP at 4 to 6 pounds, and sodium PCP at 10 to 20 pounds per acre have all given good results when applied two to six days before emergence. Where annual grasses are a problem, TCA at 8 to 10 pounds per acre may be used as a pre-emergence spray.

- **Sweet Corn**—You can use 2,4-D in sweet corn, following the same recommendations as for field corn.

- **Strawberries**—The use of 2,4-D, amine, at 1 pound per acre or sodium 2,4-dichlorophenoxy ethyl sulfate at 4 pounds per acre is suggested. The latter is effective only when applied before the weeds emerge. Do not use the herbicides on flowering or fruiting strawberries. And do not treat newly set strawberry plants until well established in the soil.

- **Raspberries**—Broad-leaved weeds in raspberries can be controlled with 2,4-D at 1-2 pounds per acre or ammonium salt of DNOSBP at 6-8 pounds per acre. Direct the sprays so that only the bases of the canes are hit.

- **Apples**—Poison ivy in apple orchards can be controlled with ammonium sulfamate applied as a wetting spray at 1 pound per gallon. Low-volatile esters of 2,4,5-T are effective in control of poison ivy but should be used with caution due to danger of injury to the apple trees.

- **Coniferous Nurseries**—Aromatic oil sprays help control broad-leaved weeds and annual grasses in coniferous nurseries. In general, from 25 to 75 gallons per acre are used, depending on the species and growth stages of the coniferous seedlings and on the drying conditions at the time of spraying. Use TCA for quackgrass control. Soil applications heavy enough to control the quackgrass can be applied the season before the germination of the coniferous seeds.

- **Gladiolus**—Two pounds per acre of 2,4-D or 8 pounds of DNOSBP or DNOSAP will control most annual broad-leaved weeds when used before the emergence of the gladiolus. Where annual grasses are a problem, a pre-emergence spray of 10 pounds per acre of TCA is effective.

- **Seedbeds and Plantbeds**—Weeds can be controlled in seedbeds and plantbeds by using steam sterilization or fumigation with methyl bromide.

- **Waste Places**—Weeds along drainage ditches and fence rows, around buildings, under irrigation lines, and in other waste places can be effectively controlled with oils, DNOSBP, DNOSAP, and PCP.

Woody Plants

Both 2,4-D and 2,4,5-T have a definite place in woody plant control. Foliage sprays of 2,4-D will kill some plants not killed by 2,4,5-T, and vice versa. Therefore, for general foliage spraying of mixed brush populations, use mixtures of 2,4-D and 2,4,5-T. The use of 2,4,5-T is especially effective in killing blackberries, wild rose, chokecherry, black cherry, and other species not as readily killed by 2,4-D. For most species and methods of treatment repeated applications are necessary.

Foliage Sprays

Treat woody plants sensitive to either 2,4-D or 2,4,5-T with wetting foliage sprays containing at least 2 pounds of acid per hundred gallons of diluent. For more tolerant species use higher concentrations. Use ester formulations for most situations, but near sensitive crops, use low-volatile ester formulations. Under most conditions water is better than oil as a diluent.

Cut Surface Treatments

Woody plants may also be killed by applying the 2,4-D or 2,4,5-T to freshly cut surfaces of stubs and stumps or to frills and cups

in standing trees. This type of treatment may be done at any time of the year. Some shrubs and trees tolerant of foliage sprays may be killed by this method. Effective on many species is 2,4,5-T, ester, in oil solutions at concentrations of 16 pounds of acid per hundred gallons applied until it runs off.

Ammonium sulfamate applied as a dry salt or as a concentrated water solution (6 to 9 pounds per gallon of water) is effective in preventing sprouting of most species of woody plants. The addition of some sticker or spreader to water solutions may be necessary.

Basal Bark Sprays

Basal stem and ground line treatments of woody plants offer promise as good control measures. Use concentrations ranging from 8 to 16 pounds of acid equivalent per hundred gallons of 2,4,5-T, ester, in oil for most species. In species like buck-brush, 2,4-D,

ester, is preferred. The entire basal area at the ground line completely encircling the plant should be wetted until it runs off. For shrubs this might involve the entire stem and in some species with rhizomes, the ground area surrounding the plant.

Soil Treatment

Sodium chlorate, sodium chloride, and borax formulations are recommended as soil treatments for control of woody plants under certain conditions. These chemicals are especially useful for spot treatment if spraying with growth regulators will not work. Sodium chlorate is useful for small patches of brush not sensitive to other herbicides and where soil sterility and fire hazards are not problems. Borax is especially adapted for soil sterilization to eliminate brush that is a fire hazard.

DESCRIPTION OF HERBICIDES RECOMMENDED

Ammonium sulfamate—ammate
 Borascu—agricultural borax, contains 10.6 per cent boron
 Concentrated Borascu—contains 19 per cent boron
 Crag Herbicide—2,4-dichlorophenoxy ethyl sulfate
 DNOSAP—4,6-dinitro-o-sec-amyl phenol—Sinox General
 DNOSBP—4,6-dinitro-o-sec-butyl phenol—Dow General
 DNOSBP, ammonium salt—Sinox W and Dow Selective
 MCP, amine—amine salt of 2-methyl-4-chlorophenoxyacetic acid—Methoxone, Chloroxone, and Agroxone
 Methyl bromide—bromomethane, soil fumigant

PCP, sodium salt—sodium salt of pentachlorophenol, water soluble
 Sodium chlorate—a fire hazard
 Stoddard solvents—petroleum distillates of low flammability
 TCA, sodium salt—sodium salt of trichloroacetic acid
 2,4-D—2,4-dichlorophenoxyacetic acid—formulated as sodium and amine salts and esters
 2,4,5-T—2,4,5-trichlorophenoxyacetic acid—formulated as sodium and amine salts and esters
 All rates of 2,4-D, 2,4,5-T, MCP, and TCA are on basis of acid equivalent. Avoid direct contact with skin and eyes, especially repeated or prolonged contact with all chemicals.

Calibration—An accurate calibration of the farm sprayer is of the greatest importance. The rates recommended for practical spray applications are based on research work in which the spraying has been done with the utmost accuracy. Field spraying must be done with exactness. Correct calibration will eliminate the waste of time, effort, and money which can accompany a poorly calibrated sprayer.

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